AMENDMENTS TO THE DRAWINGS

The attached sheets of drawings in Appendix A include changes to FIGS. 6, 12 and 16. These sheets will replace the original sheets including FIGS. 6, 12 and 16. In FIG. 6, reference "501" has been replaced with reference "600." In FIG. 12, reference "1220" for the adder has been replaced with reference "1222." Note that the reference for the trajectory planning module 1220 in FIG. 12 remains unchanged. FIG. 16 has been redrawn to make the drawing sheet clearer. Applicants respectfully submit that no substantive amendments have been made to FIG. 16.

Attachments in Appendix A: Replacement Sheets for FIGS. 6, 12 and 16.

REMARKS

The Office Action mailed April 8, 2005 has been received and reviewed. By way of summary, Claims 1-44 are currently pending in the application and Applicants have amended Claims 1, 6, 10, 11, 14, 19, 23, 28, 36, 37, 42 and 44 herein. Applicants respectfully request reconsideration of the application as amended herein and in view of the arguments hereinafter set forth.

Objections to the Drawings and Specification

The Examiner objected to several minor inconsistencies between the drawings and specification. Applicants thank the Examiner for her thoughtful and careful examination of the present application. Applicants have amended the drawings and specification herein according to the Examiner's comments. Accordingly, Applicants respectfully submit that the drawings and specification are now in condition for allowance and request the objections thereto be withdrawn.

The Examiner also objected to FIG. 17 as not being mentioned in the detailed description. Applicants have amended paragraph [0093] herein so as to discuss FIG. 17. Applicants respectfully submit that the amendments to paragraph [0093] are supported by the application as filed. In particular, this amendment is supported, for example, by a comparison of FIGS. 10 and 17. This amendment is also supported by, for example, paragraph [0026] which states that "FIG. 10 shows a modeling sample data set 2, corresponding to sample data set 1 of FIG. 9, **showing the free response results of paddle TC temperatures**" and by paragraph [0033] which states that "FIG. 17 shows typical control results of a **hybrid cascade MBPC and PID controller**, demonstrating that in various temperature controlled ranges both ramp up uniformity and steady-state temperature variations are relatively small." (Emphasis added.)

Rejection of Claims 1-44 under 35 U.S.C. § 102(b)

Claims 1-44 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,222,164 to Stoddard et al. Applicants respectfully traverse this rejection as hereinafter set forth.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v.*

Union Oil Co. of California, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, USPQ2d 1913, 1920 (Fed. Cir. 1989).

According to the Examiner, Stoddard et al. discloses "a second control loop (see figure 14) comprising a Model-Based Predictive Controller (see columns 22-23 lines 57-5, 'profile controller 98')." Applicants respectfully disagree that the profile controller 98 is a Model-Based Predictive Controller. Rather, FIG. 14 of Stoddard et al. clearly shows that the profile controller 98 is an H∞ controller. See also, col. 10, lines 17-22 (stating that "[e]ach of the controllers 96, 98, and 100 is constructed using robust optimal control theory with empirically derived models of the furnace and workpieces that are to be heated. More particularly, in the illustrated embodiment, the multivariable controllers 96, 98, and 100 are preferably constructed using H-Infinity control theory.")

One skilled in the art would recognize that a Model-Based Predictive Controller is distinct from conventional controllers such as PID controllers or the H∞ controllers taught by Stoddard et al. Such conventional controllers may use models to calculate an output. However, by contrast with Model-Based Predictive Controllers, one skilled in the art would recognize that conventional PID or H∞ controllers do not consider the future operation of the controlled process over a specified period of time referred to as a "prediction interval" or a "predictive time horizon." To further illustrate that an artisan would easily distinguish between an H∞ controller and a Model-Based Predictive Controller, Applicants respectfully refer the Examiner to the attached common definitions of "H∞ design," "model-based predictive control," and "predictive control" from the *Comprehensive Dictionary of Electrical Engineering*, pages 297, 417, 504 (CRC Press LLC 1999), a courtesy copy of which is attached hereto as Appendix B.

According to certain aspects of the present invention, a Model-Based Predictive Controller is used to predict the future behavior of the system over a time period starting at a present moment and ending at a future moment (i.e., the predictive time horizon). In certain embodiments, the predictive model is determined in an off-line model identification procedure. The Model-Based Predictive Controller then uses the model to calculate future temperature values over the predictive time horizon and compare these calculated future temperature values with desired temperature values over the predictive time horizon.

Stoddard et al., on the other hand, does not teach or suggest a Model-Based Predictive Controller. Rather, Stoddard et al. describes in relation to FIG. 15 a wafer control mode wherein element 114 is an "on-line" wafer temperature estimation model used to estimate the current wafer temperature. A. wafer temperature is estimated based on signals from spike and profile thermocouples 36, 42 and the relationship between measurements taken by thermocouple instrumented wafers 44 and measurements taken by the profile and spike thermocouples 36, 42 during a modeling process. See col. 23, line 66 to col. 24, line 19. Note that Stoddard et al. uses the word "prediction" as a synonym for "estimation" (col. 23, line 67). Applicants respectfully submit that there is no disclosure in Stoddard et al. relating to a model that performs calculations over a future, predictive time horizon.

Although Applicants respectfully disagree with the Examiner's characterization of the profile controller 98 taught by Stoddard et al. as a Model-Based Predictive Controller, Applicants have amended independent Claims 1, 14, 28, 42 and 44 herein, without altering their scope, to clarify the difference between a Model-Based Predictive Controller and the conventional controllers disclosed by Stoddard et al. Accordingly, Applicants respectfully submit that Stoddard et al. does not teach or suggest a Model-Based Predictive Controller (MBPC) that is "provided with a predictive model representing the behavior of the thermal reactor, the MBPC being configured to calculate an output value based on calculations over a **predictive time horizon**, using the predictive model," as recited, among other things, in amended Claim 1 (emphasis added).

Stoddard et al. does not teach or suggest "a second control loop comprising a Model-Based Predictive Controller (MBPC), said MBPC configured to provide a control setpoint to said conventional controller, said control setpoint based at least in part on calculations over a predictive time horizon, said MBPC further configured to receive sensor data from at least one second sensor that senses one or more operating parameters of said plant," as recited, among other things, in amended Claim 14. Stoddard et al. does not teach or suggest a "Model-Based Predictive Controller configured to calculate said control setpoint based at least in part on calculations over a predictive time horizon," as recited, among other things, in amended Claim 28. Stoddard et al. does not teach or suggest "the MBPC configured to calculate the output signal based at least in part on calculations over a predictive time horizon using a predictive

model," as recited, among other things, in amended Claim 42. Stoddard et al. does not teach or suggest a "control setpoint based at least in part on calculations over a predictive time horizon," as recited, among other things, in amended Claim 44. Therefore, Applicants respectfully request that the rejection of independent Claims 1, 14, 28, 42 and 44 be withdrawn.

Further, Applicants respectfully submit that Claims 2-13, 15-27, 29-41 and 43 are each allowable, among other reasons, as respectively depending either directly or indirectly, from independent Claims 1, 14, 28, 42 and 44, in addition to reciting further distinguishing features of particular utility. Thus, Applicants respectfully request the rejection of Claims 2-13, 15-27, 29-41 and 43 be withdrawn.

CONCLUSION

Applicants have endeavored to respond to all of the Examiners concerns. Claims 1-44 are believed to be in condition for allowance, and an early notice thereof is respectfully requested. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, the Examiner is respectfully invited to contact Applicants' undersigned attorney.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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Dated: July 7, 2005

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Appendix A

This Appendix to the AMENDMENT includes a "Replacement Sheet" for each sheet of drawings being amended. Specifically, this Appendix includes a "Replacement Sheet" for FIGS. 6, 12 and 16.